

(19)



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Office européen des brevets



(11)

EP 0 818 064 B1

(12)

EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention
of the grant of the patent:

29.12.1999 Bulletin 1999/52

(21) Application number: **96908256.9**

(22) Date of filing: **01.04.1996**

(51) Int Cl.⁶: **H01R 13/622**

(86) International application number:
PCT/GB96/00779

(87) International publication number:
WO 96/30970 (03.10.1996 Gazette 1996/44)

(54) **LOCKING COUPLING**

VERRIEGELUNGSKUPPLUNG

COUPLAGE A VERROUILLAGE

(84) Designated Contracting States:
DE ES FR GB IT

(30) Priority: **31.03.1995 GB 9506700**

(43) Date of publication of application:
14.01.1998 Bulletin 1998/03

(73) Proprietor: **ULTRA ELECTRONICS LIMITED**
Greenford, Middlesex UB6 8UA (GB)

(72) Inventors:
• **BUCKLEY, Paul, Philip**
Fernhill Heath, Worcestershire WR3 7XA (GB)

• **HALL, Rex**
Pershore, Worcestershire WR10 1HP (GB)
• **COLLIER, Malcolm, Wilfrid**
Tewkesbury, Gloucestershire GL20 5QZ (GB)

(74) Representative: **Beck, Simon Antony**
Withers & Rogers,
Goldings House,
2 Hays Lane
London SE1 2HW (GB)

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DE-B- 2 840 728 **FR-A- 2 563 949**
US-A- 2 829 358 **US-A- 4 648 671**

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Description

[0001] This invention relates to a locking coupling, especially vibration resistant locking couplings suitable for use with electrical, pneumatic, hydraulic or optical couplings.

[0002] It is common practice to connect multiple electrical conductors together simultaneously with a two-part electrical coupling comprising a pair of electrical connectors in which the conductors terminate and which are pushed together and held together longitudinally, by a coupling nut on one connector which engages a thread on the other. A harness assembly in the form of a protective sleeve may cover the conductors and be connected to the electrical connector at one end. It is also known to provide such electrical couplings with a backshell assembly which provides a transition between the conductors usually within a harness assembly, and the electrical connector in which they terminate. A backshell assembly is typically tubular in construction and is attached to the rear of the connector by a coupling nut. The rear end of the backshell assembly may also carry a fitting, such as a coupling nut, for engagement with other components of the harness assembly, such as a cable clamp.

[0003] Where electrical couplings and backshell assemblies are subjected to shock or vibration in use, there is the risk that coupling nuts may work loose, and for this reason some form of locking means is sometimes provided to prevent counter-rotation of the coupling nut once it has been tightened up. Many different forms of locking means have been proposed, but these can be complicated to manufacture, assemble and use.

[0004] US 4 648 671 describes a plug and socket arrangement where the plug is held securely to the socket by a coupling collar. In order to prevent loosening of the coupling collar, a locking collar is provided. The coupling collar is provided as part of the plug whereas the locking collar is provided as part of the socket.

[0005] FR 2563 949 discloses a plug carrying a coupling ring. The coupling ring has a plurality of windows formed therein through which an indicator can be viewed in order to provide reassurance that the coupling ring is correctly done up. The mechanism may also serve to increase the frictional forces acting on the collar once the collar is correctly tightened.

[0006] An object of the present invention is to provide a locking coupling with improved locking means.

[0007] According to the present invention, there is provided a locking coupling comprising: a body adapted for connection to a separate body; a coupling collar rotatably mounted on said body and adapted to cooperate with said separate body to hold it in axial connection with said body, said coupling collar being rotatable in a locking sense to hold said body and said separate body together, and in a release sense to release said body from said separate body; characterised by a locking collar mounted on said body and longitudinally movable with

respect to the coupling collar between locking and unlocking positions; bias means that urge the locking collar towards the locking position; and locking formations on the locking collar and coupling collar; and in that the locking collar is restrained from rotating when it is at the locking position and in that the locking formations on the coupling collar interengage axially with those on the locking collar when the locking collar is moved to the locking position so as to restrain the coupling collar against rotation in the release sense on said body).

[0008] Preferably, the locking collar can be retained in the unlocking position by retention formations on the locking collar and body that interengage longitudinally. For example, the retention formations may comprise keying means that guide the locking collar longitudinally on the body and allow rotation of the locking collar on the body only in the unlocking position, when the keying means then cooperate longitudinally to retain the locking collar in the unlocking position.

[0009] Preferably, the locking collar is held captive longitudinally on the body by the coupling collar, and the coupling collar in turn is held captive on the body by a separate fastener such as an internal circlip.

[0010] Preferably, the locking formations comprise axially extending teeth which may have a sawtooth form so as to restrain the coupling collar against rotation in one sense which would otherwise allow uncoupling of said separate body. The teeth comprise a long sloping side and a short side which is substantially parallel with the longitudinal axis of the connector. The short side may be undercut (i.e. inclined in the same sense as the long sloping side) to enhance the locking action of the coupling.

[0011] An additional preferred feature of the invention comprises indicator means on said body which is covered by the locking collar and only exposed as a warning when the locking collar is in the unlocking position.

[0012] The invention will now be described by way of example with reference to the accompanying drawings in which:

Figure 1 is a part side elevation and part axial section of a locking coupling according to the invention with the locking collar in the locking position;

Figure 2 is an enlargement of part of the drawing of Figure 1;

Figure 3 is a similar view to that of Figure 1, except that it shows the locking collar in the unlocking position;

Figure 4 is an end elevation of the body of the locking coupling of Figure 1; and

Figure 5 is a view of the locking collar of the locking coupling of Figure 3 on the line S-S.

[0013] The illustrated embodiment comprises a tubular body 1, which may be a backshell adaptor to support a bundle of electrical cables that enter it from the rear and terminate in an electrical connector supported within the front end of the backshell. A coupling nut 2 is rotatably mounted on the front end of the body 1 and is held captive longitudinally thereon by a circlip 3 engaging respective annular grooves in the cooperating surfaces of the nut and body. The nut 2 projects longitudinally beyond the end of the body 1 and is threaded internally for engagement with the aforesaid electrical connector when in use.

[0014] Adjacent to the rear of the coupling nut 2, a locking ring or collar 4 is mounted on the body 1, and is formed with a set of inwardly projecting lugs 5 which engage respective longitudinally extending grooves 6 in an annular collar 9 formed on the outer surface of the body so as to guide the locking ring 4 longitudinally over a short section of its length between the rear face of the nut 2 and an outwardly projecting annular flange 7 around the periphery of the body 1. A spring washer 8 is located between the flange 7 and rear face of the locking ring 4 and acts to urge the latter to a locking position in engagement with the rear face of the coupling nut 2, as shown in Figure 1.

[0015] The rear annular face of the coupling nut 2 is formed with teeth 10 that project longitudinally of the body 1 towards the locking ring 4, and the adjacent annular face of the locking ring 4 is formed with teeth 11 that project longitudinally of the body 1 towards the coupling nut 2 so as to cooperate with the teeth 10 on the latter. These teeth 10 and 11 run in a sawtooth form around the full annular length of the faces, respectively with corresponding alternating inclined and circumferentially abutting edges so that the teeth can ride over one another with a ratchet action when the nut 2 is rotated in one sense to secure an electrical connector to the body 1, and lock together circumferentially to prevent rotation of the nut 2 in the opposite sense that would release said electrical connector. Thus, it is only when the locking ring 4 is moved longitudinally against the action of the spring washer 8 to disengage the teeth 10, 11 that the coupling nut 2 can be rotated to release said electrical connector. Furthermore, the arrangement of the teeth 10, 11 is such that an interengaging locking action is maintained even if the locking ring 4 is tilted accidentally on the body 1, the teeth 10, 11 disengaging on one side of the body, but remaining in engagement on the other of the body.

[0016] In order that the locking ring 4 can be retained in a longitudinal unlocking position spaced away from the coupling nut 2, the inwardly projecting lugs 5 and collar 9 are dimensioned longitudinally so that the lugs 5 disengage the grooves 6 and are located in the annular groove 12 between the flange 7 and collar 9, as shown in Figure 3, whereupon the ring 4 can be rotated to a position in which the lugs 5 are out of alignment with the grooves 6. The ring 4 can then be released and will

be retained longitudinally by engagement of the lugs 5 with the adjacent side wall of the collar 9 through the spring action of the washer 8. Further rotation of the locking ring 4 whilst spring-loaded against the side wall of the collar will release the ring from the unlocking position when the lugs 5 again come into alignment with the grooves 6, the ring 4 then being free to move longitudinally. Annular recesses 14 and 15 are provided in the adjacent faces of the flange 7 and locking ring 4 to accommodate the spring washer 8 when the locking ring is in the unlocking position.

[0017] The groove 12 to the rear of the collar 9 is coloured green or blue so as to indicate when the locking ring 4 is in the locking position, and a shallow groove 13 forward of the collar 9 is coloured red so that it is clearly visible when the locking ring is in the unlocking position, and thereby serving as a warning that the coupling nut 2 is not locked.

[0018] The outer circumferential surfaces of the coupling nut 2 and locking ring 4 are each textured to assist gripping and rotation, this being especially important in oily environments. Also, the texturing used, whether knurling or ribs, are preferably different in each case to assist tactile differentiation between the two components in question.

[0019] The outer diameters of the coupling nut 2 and locking ring 4 are preferably different so as to assist selective operation of one or the other and avoid accidental operation of either member. For example, accidental rotation of the locking ring 4 by a tool engaging the coupling nut 2 could damage the lugs 5 of the former so that it is no longer effective. This can be avoided by making the locking ring 4 of smaller diameter than the coupling nut 2, as shown in the drawings, but equally the locking ring 4 could be made significantly larger in diameter to avoid the same problem.

[0020] In some applications, a special tool might be provided to operate the locking ring.

[0021] The number of teeth can be freely chosen to select the amount of rotation that separates each locking position. It has been found that a resolution of 10° or so between each locking position maintains good electrical connection between the opposing parts of the coupling. This requires the provision of 30 or more teeth on the nut and locking ring.

[0022] Drain holes may be provided in the region of the spring washer 8 to allow the escape of moisture due to condensation.

[0023] In a further arrangement, the short faces of the teeth may be inclined with respect to the longitudinal axis of the connector by between substantially 0 and 5° in an undercut manner to further enhance the resistance of the locking ring to unintentional disengagement due to extreme vibration.

Claims

1. A locking coupling comprising: a body (1) adapted for connection to a separate body; a coupling collar (2) rotatably mounted on said body and adapted to cooperate with said separate body to hold it in axial connection with said body, said coupling collar being rotatable in a locking sense to hold said body (1) and said separate body together, and in a release sense to release said body from said separate body; characterised by a locking collar mounted on said body and longitudinally movable with respect to the coupling collar between locking and unlocking positions; bias means (8) that urge the locking collar (4) towards the locking position; and locking formations (10,11) on the locking collar and coupling collar; and in that the locking collar (4) is restrained from rotating when it is at the locking position and in that the locking formations on the coupling collar interengage axially with those on the locking collar when the locking collar is moved to the locking position so as to restrain the coupling collar against rotation in the release sense on said body (1).
2. A locking coupling as claimed in claim 1 in which the locking collar (2) is retained in the unlocking position by retention formations (5,9) on the locking collar and body that interengage longitudinally.
3. A locking coupling as claimed in claim 2 in which the retention formations comprise keying means that guide the locking collar longitudinally on the body and allow rotation of the locking collar on the body only in the unlocking position, when the keying means then cooperate longitudinally to retain the locking collar in the unlocking position.
4. A locking coupling as claimed in any one of the preceding claims in which the locking collar (4) is held captive longitudinally on the body by the coupling collar (2), and the coupling collar in turn is held captive on the body by a separate fastener (3).
5. A locking coupling as claimed in claim 4 in which the separate fastener (3) comprises an internal clip.
6. A locking coupling as claimed in any one of the preceding claims in which the locking formations comprise axially extending teeth (10,11).
7. A locking coupling as claimed in claim 6 in which the teeth have a tooth form so as to restrain the coupling collar against rotation in one sense which would otherwise allow uncoupling of said separate body.

8. A locking coupling as claimed in any one of the preceding claims in which indicator means on said body is covered by the locking collar and only exposed as a warning when the locking collar is in the unlocking position.

Patentansprüche

1. Eine Verriegelungskupplung, aufweisend: einen Körper (1), der zur Verbindung mit einem separaten Körper angepaßt ist; und einen Kupplungskragen (2), der an dem Körper drehbar angebracht und dazu angepaßt ist, mit dem separaten Körper zusammenzuarbeiten, um diesen in axialer Verbindung mit dem Körper zu halten, wobei der Kupplungskragen in einem Verriegelungssinne, um den Körper (1) und den separaten Körper zusammenzuhalten, und in einem Freigabesinne drehbar ist, um den Körper von dem separaten Körper freizugeben; gekennzeichnet durch: einen Verriegelungskragen, der an dem Körper angebracht und in Längsrichtung in bezug auf den Kupplungskragen zwischen einer Verriegelungsposition und einer Entriegelungsposition bewegbar ist; eine Vorspanneinrichtung (8), welche den Verriegelungskragen (4) in Richtung zu der Verriegelungsposition drängt; und Verriegelungsgebilde (10, 11) an dem Verriegelungskragen und an dem Kupplungskragen; und dadurch gekennzeichnet, daß der Verriegelungskragen (4) gegen Drehen gehemmt ist, wenn er in der Verriegelungsposition ist, und daß die Verriegelungsgebilde an dem Kupplungskragen mit jenen an dem Verriegelungskragen axial ineinander eingreifen, wenn der Verriegelungskragen in die Verriegelungsposition bewegt ist, um den Kupplungskragen gegen Drehung in dem Freigabesinne an dem Körper (1) zu hemmen.
2. Eine Verriegelungskupplung, wie in Anspruch 1 beansprucht, bei welcher der Verriegelungskragen (2) durch Haltegebilde (5, 9) an dem Verriegelungskragen und an dem Körper in der Entriegelungsposition gehalten ist, wobei die Haltegebilde (5, 9) in Längsrichtung eineinander eingreifen.
3. Eine Verriegelungskupplung, wie in Anspruch 2 beansprucht, bei welcher die Haltegebilde Vorsprung-Nut-Mittel aufweisen, welche den Verriegelungskragen in Längsrichtung auf dem Körper führen und eine Drehung des Verriegelungskragens auf dem Körper nur in der Entriegelungsposition erlauben, wenn die Verkeilmittel sodann in der Längsrichtung zusammenarbeiten, um den Verriegelungskragen in der Entriegelungsposition zu halten.
4. Eine Verriegelungskupplung, wie in einem der vorhergehenden Ansprüche beansprucht, bei welcher

der Verriegelungskragen (4) in der Längsrichtung an dem Körper durch den Kupplungskragen (2) unverlierbar gehalten ist und der Kupplungskragen seinerseits an dem Körper durch eine separate Befestigungseinrichtung (3) unverlierbar gehalten ist.

5. Eine Verriegelungskupplung, wie in Anspruch 4 beansprucht, bei welcher die separate Befestigungseinrichtung (3) einen inneren Sicherungsring aufweist.

6. Eine Verriegelungskupplung, wie in einem der vorhergehenden Ansprüche beansprucht, bei welcher die Verriegelungsgebilde axial vorstehende Zähne (10, 11) aufweisen.

7. Eine Verriegelungskupplung, wie in Anspruch 6 beansprucht, bei welcher die Zähne eine solche Zahnform aufweisen, daß sie den Kupplungskragen gegen Drehung in einem bestimmten Sinne hemmen, in welchem Drehsinn ohne die Zähne eine Entkuppung des separaten Körpers möglich wäre.

8. Eine Verriegelungskupplung, wie in einem der vorhergehenden Ansprüche beansprucht, bei welcher eine Anzeigeeinrichtung an dem Körper durch den Verriegelungskragen abgedeckt ist und nur dann als eine Warnung freigelegt ist, wenn der Verriegelungskragen in der Entriegelungsposition ist.

Revendications

1. Couplage à verrouillage comprenant: un corps (1) apte à être accouplé avec un corps séparé; un collier de couplage (2) monté de manière à pouvoir tourner sur ledit corps et apte à coopérer avec ledit corps séparé pour maintenir celui-ci accouplé de manière axiale avec ledit corps, ledit collier de couplage pouvant tourner dans un sens de verrouillage afin de maintenir assemblés ledit corps (1) et ledit corps séparé, et dans un sens de déverrouillage pour dégager ledit corps dudit corps séparé; caractérisé par une bague de verrouillage montée sur ledit corps et pouvant se déplacer longitudinalement par rapport au collier de couplage entre des positions de verrouillage et de déverrouillage; des moyens de sollicitation (8) qui poussent la bague de verrouillage 4 vers la position de verrouillage; et des formations de verrouillage (10, 11) sur la bague de verrouillage et le collier de couplage; et en ce que la bague de verrouillage (4) ne peut pas tourner lorsqu'elle est dans la position de verrouillage et en ce que les formations de verrouillage présentes sur le collier de couplage coopèrent de manière axiale avec celles présentes sur la bague de verrouillage lorsque la bague de verrouillage est placée dans la position de verrouillage de façon à empêcher le col-

lier de couplage de tourner dans le sens de dégagement sur ledit corps (1).

2. Couplage à verrouillage selon la revendication 1, dans lequel la bague de verrouillage (2) est retenue dans la position de déverrouillage par des formations de retenue (5, 9) présentes sur la bague de verrouillage et le corps et coopérant longitudinalement.

3. Couplage à verrouillage selon la revendication 2, dans lequel les formations de retenue comportent des moyens de clavetage qui guident longitudinalement la bague de verrouillage sur le corps et permettent la rotation de la bague de verrouillage sur le corps uniquement dans la position de déverrouillage, lorsque les moyens de clavetage coopèrent ensuite longitudinalement pour retenir la bague de verrouillage dans la position de déverrouillage.

4. Couplage à verrouillage selon l'une quelconque des revendications précédentes, dans lequel la bague de verrouillage (4) est retenue prisonnière longitudinalement sur le corps par le collier de couplage (2), et le collier de couplage est lui-même retenu prisonnier sur le corps par une fixation séparée (3).

5. Couplage à verrouillage selon la revendication 4, dans lequel la fixation séparée (3) comporte un jonc d'arrêt interne.

6. Couplage à verrouillage selon l'une quelconque des revendications précédentes, dans lequel les formations de verrouillage comportent des dents (10, 11) qui s'étendent de manière axiale.

7. Couplage à verrouillage selon la revendication 6, dans lequel les dents ont une forme permettant d'empêcher le collier de couplage de tourner dans un sens, ce qui, autrement, permettrait le dégagement dudit corps séparé.

8. Couplage à verrouillage selon l'une quelconque des revendications précédentes, dans lequel un moyen formant témoin sur ledit corps est couvert par la bague de verrouillage et n'est visible en tant que moyen d'avertissement que lorsque la bague de verrouillage est dans la position de déverrouillage.

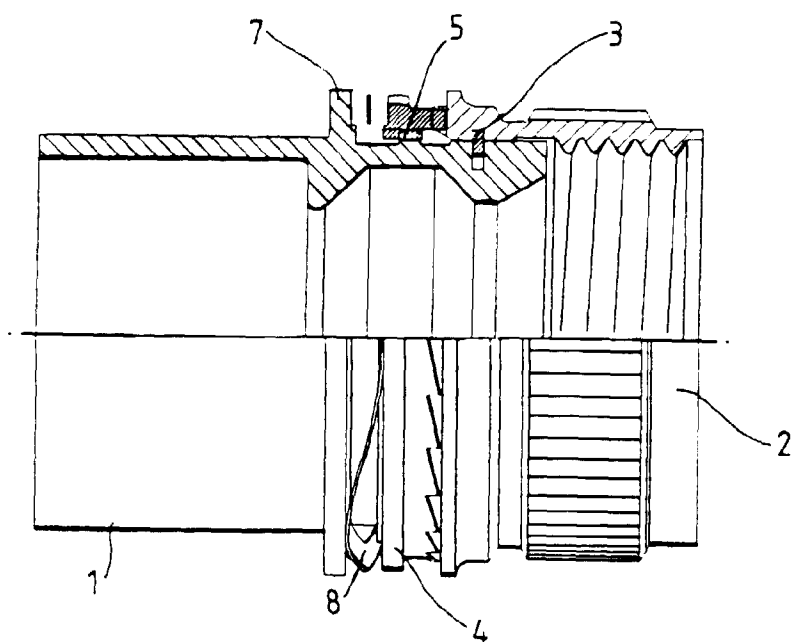


Fig.1.

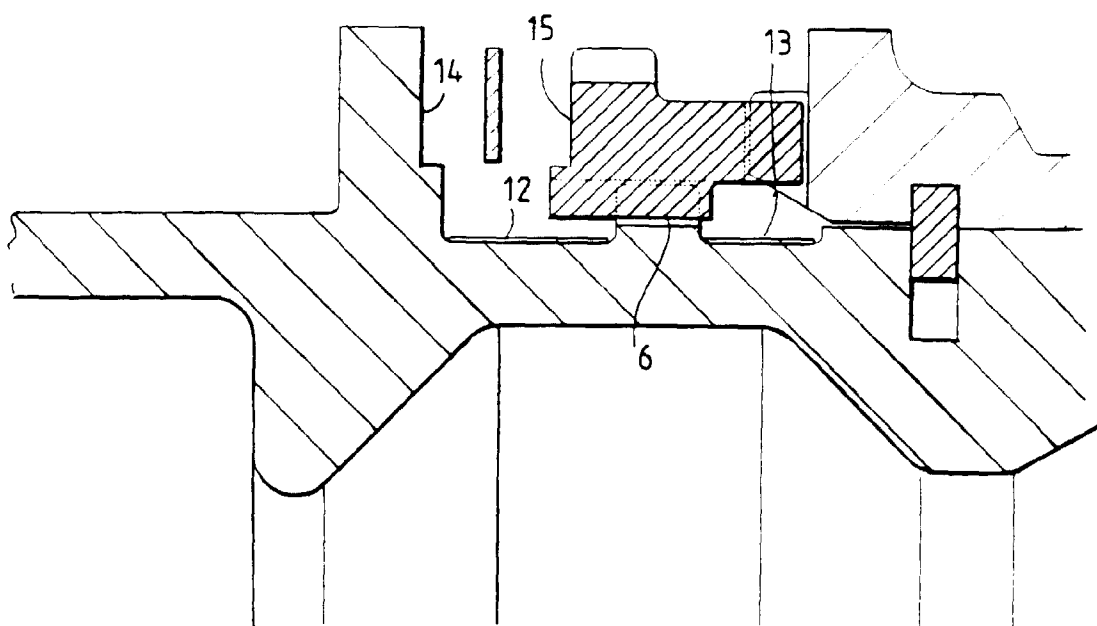


Fig.2.

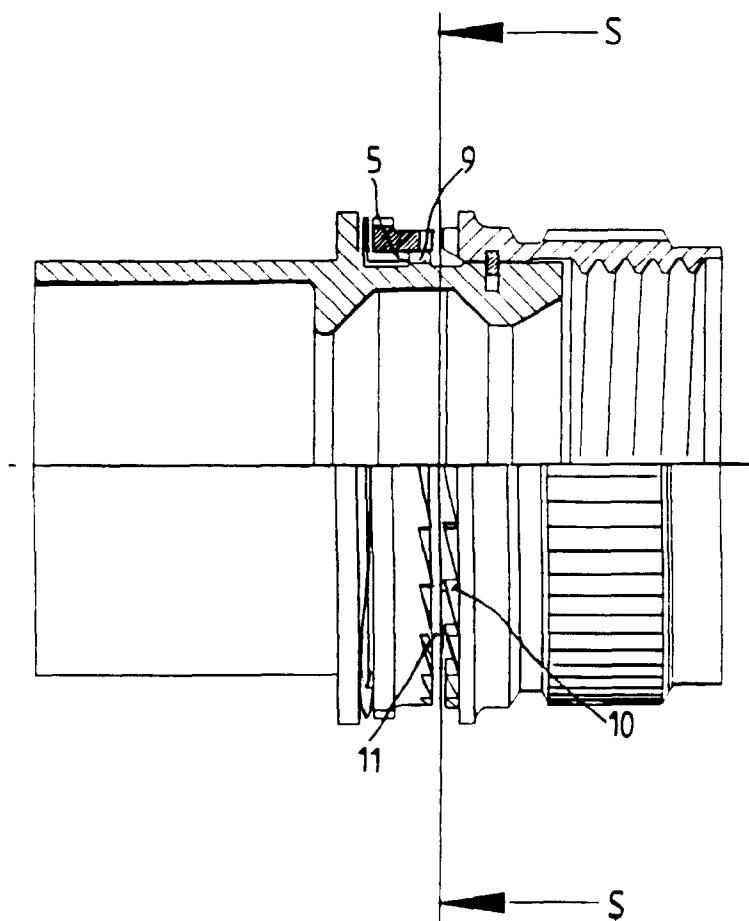


Fig.3.

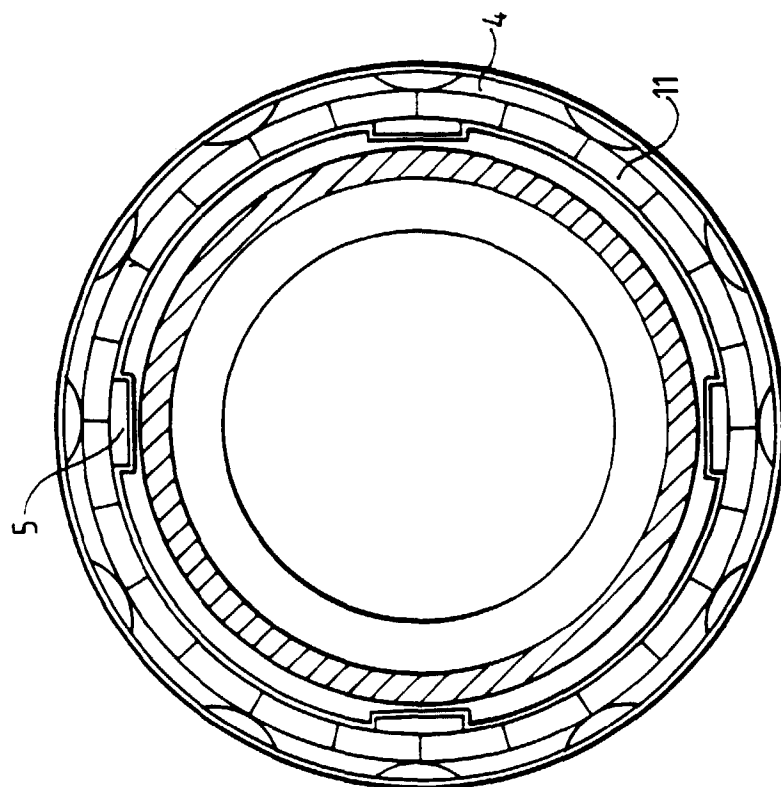


Fig.5.

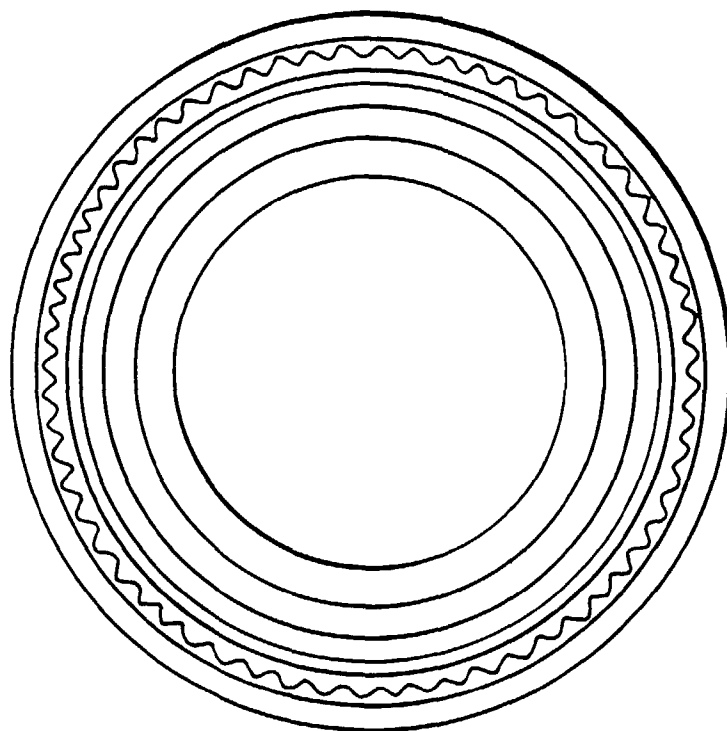


Fig.4.